

United States of America  
Department of Transportation — Federal Aviation Administration  
**Supplemental Type Certificate**

*Number*

SA2221NM

*This certificate, issued to*

UNITED STATES AIRCRAFT CORPORATION

*certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 4b of the Civil Air Regulations.*

Dated December 31, 1953 (See page 3 of this STC for the completed certification basis)

*Original Product — Type Certificate Number:* A-669

*Make:* McDonnell Douglas Corporation (MDC)

*Model:* DC3C, S/N 26744 (DC3C-R-1830-90C)

*Description of Type Design Change:* Installation of Pratt & Whitney of Canada PT6A-45R engines, Hartzell HC-B5MP-3C/M1086B propellers, and associated modifications to engine mounting, nacelle, fuselage, wings empennage, accessories & systems, in accordance with FAA sealed United States Aircraft Drawing List No. 1001, Revision "P" or later FAA approved revisions. United States Aircraft Corporation FAA approved Airplane Flight Manual Report 0046, dated December 1, 1983, or later FAA approved revisions for USAC Model DC3-TP is required as part of this installation.

*Limitations and Conditions:* The type design changes described above are applicable to MDC DC3C S/N 26744 only. Data pertaining to this modification are considered inadequate for duplication on other aircraft of this type. The limitations & conditions of Aircraft Specification A-669 apply except as outlined in Supplemental Aircraft Specification SA2221NM documented in the continuation sheets of this STC. A copy of this STC must be included in the permanent records of this airplane as modified in accordance with this STC.

*This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.*

*Date of application:* April 17, 1978

*Date reissued:*

*Date of issuance:* December 1, 1983

*Date amended:* Nov. 18, 1984



*By direction of the Administrator*

*(Signature)*  
Manager, Western Aircraft  
Certification Office

*(Title)*

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

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CERTIFICATION BASIS (CONTINUED)

Based upon the application for STC, dated April 17, 1978, the applicable regulations are:

- (1) FAR 21 Subpart E - Supplemental Type Certificate includes FAR 21.111 thru 21.119, FAR 21.101(a) & (c), FAR 21.31 thru FAR 21.39, FAR 21.53, FAR 21.93(b).
- (2) SFAR 13 effective September 10, 1954.
- (3) CAR 4b effective December 31, 1953, except where superseded FAR 25 requirements.
- (4) FAR 25 sections as amended by Amendments 25-1 thru 25-43.
- (5) FAR 36 including Amendments 36-1 thru 36-9.
- (6) SFAR 27 Fuel Venting and Exhaust Emission requirement for Turbine Powered Airplanes.

SUPPLEMENTAL AIRCRAFT SPECIFICATION NO. SA2221NM

The conditions & limitations of Aircraft Specification No. A-669 apply except as follows:

This specification, which is a part of Supplemental Type Certificate No. SA2221NM, prescribes conditions and limitations under which the product for which the Supplemental Type Certificate was issued meets the airworthiness requirements of the Civil Air Regulations. A copy of this Supplemental Type Certificate Specification shall be maintained as part of the modified aircraft's permanent records.

Supplemental Type  
Certificate Holder

UNITED STATES AIRCRAFT CORPORATION  
4511 Empire Avenue  
Hangar Five  
Burbank, California 91505-1172

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Model: DC3-TP (DC3-R-1830-90C)/C47B as modified by STC SA2221NM Approved December 1, 1983.

Engine 2 Pratt & Whitney of Canada PTA6-45R.

Fuel Pratt & Whitney of Canada Service Bulletin 3044 (See NOTE 10).

Oil Pratt & Whitney of Canada Service Bulletin 3011 (See NOTE 11).

Engine Limits Ratings

Takeoff (5 min.)

Equivalent shaft horsepower	1254
Shaft horsepower	1198
Jet thrust, lbs.	140

Maximum continuous at sea level

Equivalent shaft horsepower	1070
Shaft horsepower	1020
Jet thrust, lbs.	127

The engine ratings are based on static sea level conditions. No external accessory loads and no airbleed. The PT6A-45R maximum continuous rating is available to 92°F Air Inlet Temperature and takeoff is available to 73°F Air Inlet Temperature.

RPM Limits (See NOTE 5)

TORQUE	Ng		Np	
	PSI	RPM	%	RPM
Takeoff (5 min.)	44.24	39,000	104	1700
Maximum continuous	37.68	39,000	104	1700
Transient overspeed (5 sec.)	61.0	39,000	104	1870

(See NOTE 5).

For propeller ground operation  
(See NOTE 6).

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Inter-Turbine Temperature

Takeoff (5 min.)	845°C
Max continuous	812°C
Starting transient (5 sec.)	1000°C

Fuel Pressure

Fuel: \*Minimum pressure at inlet to the engine fuel system shall not be less than 5 p.s.i. above true vapor pressure of the fuel. For emergency operation, with airframe boost pump inoperative, it must be such that vapor liquid ratio does not exceed 0.1 for continuous operation and does not exceed 0.3 for more than 10 hours in a pump overhaul life.

Maximum pressure at inlet to fuel system: 50 p.s.i.g.

Oil Pressure (See NOTE 7).

Maximum	135 psig
Normal	90-135 psig
Minimum	60 psig

Oil Inlet Temperature (See NOTE 8).

Maximum	99°C
Minimum for takeoff	+10°C
Minimum for starting	-40°C

Propeller and 2 Hartzell HC-B5MP-3C/M10876B.  
Propeller Limits Diameter 110.7 - 111.32

Pitch settings (42 in. sta.)

Low pitch	+13° ± .2°
Feather	+79° ± .5°
Reverse	-11° ± .5°

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Airspeed Limits

	<u>CAS</u>		<u>IAS</u>	
	<u>KTS</u>	<u>MPH</u>	<u>KTS</u>	<u>MPH</u>
V <sub>MO</sub> (maximum operating)	187	215	184	211.5
V <sub>A</sub> (maneuvering)	111	127.5	107	123
V <sub>LO</sub> (landing gear operation)	144	165.5	141	162.5
V <sub>LE</sub> (landing gear extended)	144	165.5	141	162.5
V <sub>FE</sub> (flaps extended 1/4)	135	155.5	133	153
V <sub>FE</sub> (flaps extended 1/2)	99	114	97	111.5
V <sub>FE</sub> (flaps extended 3/4 to full)	97	111.5	95	109.5

Maximum Operating Altitude 20000 feet pressure altitude  
 (See NOTE 15).

C. G. Range      Fuselage Sta. 242.35 inches (13% MAC)  
                      Fuselage Sta. 263.1 inches (28% MAC)

Maximum Weight      Takeoff 26,900 lbs.  
                              Landing 26,900 lbs.

Minimum Crew      2 (pilot and copilot)

Maximum Passengers      See NOTE 14

Maximum Baggage      Baggage Compartment "B" Max. Wt. 800 lbs.  
                              Baggage Compartment "H" Max. Wt. 350 lbs.  
                              (For further information see ATS Weight &  
                              Balance report 1291).

Fuel Capacity TANK	<u>USABLE CAPACITY</u>		<u>TOTAL CAPACITY</u>	
	<u>U.S. GALLONS</u>	<u>POUNDS</u>	<u>U.S. GALLONS</u>	<u>POUNDS</u>
Main L.H.	185.0	1,240	195.0	1,307
Main R.H.	185.0	1,240	195.0	1,307
Auxiliary L.H.	185.5	1,243	187.0	1,253
Auxiliary R.H.	185.5	1,243	187.0	1,253
TOTAL	741.0	4,966	764.0	5,120

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NOTE: WEIGHTS BASED ON A FUEL DENSITY OF 6.7 POUNDS PER U.S. GALLON.

Oil capacity            1 tank integral with each engine, 2.5 U.S. Gallons.  
Total usable oil, 1.5 U. S. Gallons.

Serial No. Eligible 26744 ONLY

Required Equipment    In addition to the pertinent required basic equipment specified in CAR 4b and FAR 25 (for the turbopropeller installation) refer to "Required Equipment List" USAC Report 0047. Dated 11/21/83. Rev. N/C.

Specifications Pertinent to this Model

Datum	Fuselage station "0" (40" aft of tip of nose).
Leveling Means	Pins on outside of fuselage at station 390.5 and 411.5 below windows (fore and aft leveling). Pins in left and right hand center section station 222 (lateral leveling).
Control Surface Movements	Elevator up $12 + 1/8$ inches, down $8 + 1/8$ inches. Aileron up $13 + 1/8$ inches, down $8 + 1/2$ inches. Rudder left $26 1/4$ inches, right $26 1/4$ inches. (See Note 9).
Production Basis	None
Export Eligibility	None
Certification Basis	(1) FAR 21 Subpart E - Supplemental Type Certificate includes FAR 21.111 through 21.119, FAR 21.101(a) & (c), FAR 21.31 through 21.39, FAR 21.93(b). (2) SFAR 13 effective September 10, 1954. (3) CAR 4b effective December 31, 1953, except where superseded FAR 25 requirements. (4) FAR 25 sections as amended by Amendments 25-1 through 25-43. (5) FAR 36 including Amendments 36-1 through 36-9. (6) FAR 27 Fuel Venting and Exhaust Emission requirement for Turbine Powered Airplanes.

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- NOTE 1 (a) Current weight and balance report including list of equipment included in certificated weight empty, and loading instructions, must be in each aircraft at the time of original certification and at all times thereafter (except in the case of air carrier operators having an approved weight control system).
- (b) System fuel must be included in the empty weight of the airplane. System fuel is defined as the fuel required to fill the fuel system up to the fuel tank outlet plus the fuel tank unusable fuel quantity.
- Full oil tank and full hydraulic tank fluids must also be included in the empty weight of the airplane.
- (c) The "unusable fuel" is that amount of fuel in the tanks which is unavailable to the engine under critical flight conditions as defined in CAR 4b.416 and may be obtained by taking the difference between the total fuel capacities and "usable" tank capacities shown in this specification. The "unusable fuel" must be included in the empty weight or be suitably accounted for in the airplane weight and balance report.
- (d) The engines utilize fuel only from the center wing forward main tanks.
- (e) A crossfeed system is provided to feed fuel from an opposite center wing forward main tank to engine.
- (f) Fuel must be loaded in the following order:  
(1) Fill center wing forward main tanks symmetrically.  
(2) If fuel load exceeds capacity of center wing forward tanks, service center wing auxiliary transfer tanks symmetrically.

- NOTE 2 The following placards shall be placed in the locations noted:
- (a) On the instrument panel in full view of the pilots: "This airplane shall be operated in compliance with the operating limitations specified in the FAA Approved Airplane Flight Manual."
- (b) On upper center portion of copilot's instrument panel:
- |  |          |
|--|----------|
| V <sub>MO</sub> Operating              | 184 KIAS |
| V <sub>A</sub> Maneuvering             | 107 KIAS |
| V <sub>LO</sub> Landing Gear Operation | 141 KIAS |

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NOTE 2(con't)

$V_{LE}$ Landing Gear Extended	141	KIAS
$V_{FE}$ Flaps Landing	1/4	133 KIAS
	1/2	97 KIAS
	3/4 or Full Down	95 KIAS

NOTE 3 All Airworthiness Directives applicable to FAA Aircraft specification A-669 also are effective for the DC3-C as modified by STC SA2221NM.

NOTE 4 Airworthiness Directives currently in effect or issued subsequent to the date of this STC, which involve the Pratt & Whitney PT6A-45R Engine or the Hartzell HC-B5MP-3C/M10876B propellers are applicable to the engines or the propellers installed under this STC, and applicability statement of such Airworthiness Directives notwithstanding.

NOTE 5 Maximum overspeed limit is as specified for transient overspeed. If these limits are exceeded, consult Pratt & Whitney of Canada Maintenance Manual No. 3027042, table 603 for disposition of engine or gear reduction box.

NOTE 6 Ground Operation:

- (a) Stabilized operation below 53%  $N_p$  (900 RPM) prohibited, except when propeller is feathered operation<sup>p</sup> between 23.5%  $N_p$  (0 to 400 RPM) is permissible
- (b) Stabilized operation between 69%  $N_p$  (1170 RPM) and 82%  $N_p$  (1400 RPM) is prohibited.
- (c) Advanced above 94%  $N_p$  (1600 RPM) only after brake release for takeoff roll, otherwise, limit operation above 94%  $N_p$  (1600 RPM) to functional testing performed with aircraft headed into the wind.

NOTE 7 Oil pressure at 75%  $N_g$  (27,000 RPM) gas generator speed and above with an oil temperature of 140-160°F: 105-135 p.s.i.g. Below 75%  $N_g$  (27,000 RPM) gas generator speeds: 60 p.s.i.g. (min.). Extreme cold starts oil pressure may reach 200 psi.

NOTE 8 Oil temperature range continuous from minus 40°F (-40°C) to 210°F (99°C). Limited periods of 10 minutes of 220°F (104°C) are allowable.

NOTE 9 Travels shown are with elevator down springs and rudder return spring disconnected. See Supplemental Service Manual USAC Manual 0003 for complete rigging instructions.

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NOTE 10 APPROVED FUELS

<u>FUEL</u>	<u>SPECIFICATION</u>
Jet A	ASTM 1655
Jet A-1	ASTM 1655
Jet-B	ASTM 1655
JP-4	ASTM 1655 or MIL-T-5624
JP-5	MIL-T-5624
JP-8	MIL-T-83133

The use of aviation gasoline (AVGAS) is not approved. For additional information see P & WC Service Bulletin No. 3044.

NOTE 11 APPROVED LUBRICATING OILS

Aeroshell Turbine Oil 500  
Mobil Jet Oil II  
Mobil Jet Oil 254  
Stauffer Jet II  
Castrol 5000  
Esso/Exxon Turbo Oil 2380

For additional information see P & WC Service Bulletin No. 3001.

NOTE 12 Fuel anti-icing additives conforming to specifications 3GP-526A, PFA 55MB, MIL-I-27686D or MIL-I-27686E may be used, at a concentration not exceeding 0.15% by volume.

NOTE 13 Noise Characteristics: No acoustical change was shown under the provisions of FAR Paragraph 21.93(b). Noise measurements taken in flyover tests have demonstrated that the noise levels of the PT6A-45R powered aircraft are no noisier than the noise levels of the R-1830 powered aircraft, at their respective maximum take-off and landing weights available for a sea level airport at ISA + 10°C (ISA + 18°F).

NOTE 14 The aircraft is approved with the following limitations: "No passengers or cargo may be carried until an FAA approved interior is installed." See FAR 91.47 for maximum passengers when an FAA approved interior is installed, except as allowed under maximum baggage.

NOTE 15 Engine and airframe certificated operating temperature limits: minimum - 40°C (-40°F) to ISA + 30°C (ISA + 54°F) maximum.

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